Fundamental Mechanics: Quiz 10

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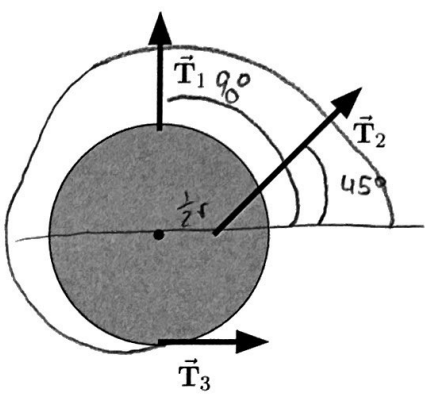
Name: Taylor Larrechea **Total:** 3.5 /5

Formulae: $\Delta s = r\Delta\theta$ $\omega = \frac{d\theta}{dt}$ $\alpha = \frac{d\omega}{dt}$ $v_t = \omega r$ $a_t = \alpha r$ $g = 9.80\,\mathrm{m/s^2}$

$x_{\mathrm{cm}} = \frac{\Sigma x_i m_i}{\Sigma m_j}$ $y_{\mathrm{cm}} = \frac{\Sigma y_i m_i}{\Sigma m_j}$ $I = \Sigma m_i r_i^2$ $\tau = rF\sin\phi$

A disk with radius R can rotate about an axle through its center. Three ropes are attached to various points on the disk and pull as indicated. The magnitudes of the tensions are: $T_1 = 100\,\mathrm{N}, T_2 = 150\,\mathrm{N}$, and $T_3 = 80\,\mathrm{N}$. The angle between $\vec{\mathbf{T}}_2$ and the horizontal is 45°. Rank the torques (about the center of the disk) in order of increasing magnitude.



$\tau = rF\sin\theta$

T_1 $\theta = 90°$ (0.5) $T_1 > T_2 > T_3$

T_2 $\theta = 45$

Smallest to greatest

$\tau_1 = rF\sin 90$

$\tau_2 = \frac{1}{2}rF\sin 45°$

$\tau_3 = ??$ (-1)

$\tau_3 < \tau_2 < \tau_1$